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Cochlear implant eligibility in an adult hearing aid population: a multi-perspective service evaluation of a patient referral pathway at a British district general hospital

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Main Article

Mr A Trinidade takes responsibility for the integrity of the content of the paper

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Abstract

Objectives. To quantify patient eligibility for cochlear implantation following National Institute for Health and Care Excellence 2019 guidelines (TA566) over five years at our institution, and identify factors influencing patients' decisions surrounding cochlear implantation referral.
Methods. A multi-perspective service evaluation was conducted at a district general hospital, comprising cochlear implantation eligible patients. The main outcome measures were: eligibility numbers for 2014–2019, comparing application of TA566 versus 2009 (TA166) guidelines; and patient interview transcripts and questionnaires.
Results. There was a 259 per cent average increase in cochlear implantation eligibility from 2014 to 2019. Most patients' thresholds were 80 dB HL or more at 3 kHz and 4 kHz. There are several cochlear implantation barriers, including patient-centred issues (e.g. health-related anxieties, implantation misperceptions) and external barriers (difficulty getting to regional implant centres). Motivating factors for cochlear implantation include improved quality of life and access to local cochlear implantation services.
Conclusion. The TA566 guidelines have increased cochlear implantation eligibility, putting pressure on cochlear implantation centres and referring hospitals. Current referral systems have external and patient-centred implantation barriers. British cochlear implantation delivery may need rethinking to meet increasing populational demands and improve accessibility for those most vulnerable to these barriers.

Introduction

In March 2019, the National Institute for Health and Care Excellence (NICE) changed the criteria thresholds for patients with profound sensorineural hearing loss (SNHL) who qualify for cochlear implantation, as reported within the TA566 guidelines.[1] Prior to this, patients with profound SNHL were considered eligible for cochlear implantation if they could not hear sounds lower than 90 dB HL when tested at 2 kHz and 4 kHz without acoustic hearing aids, and did not derive adequate benefit with hearing aids, as per the 2009 TA166 guidelines.[2] Profound SNHL patients should now be considered for cochlear implantation if they can only hear sounds of 80 dB HL or more at two or more frequencies (0.5, 1, 2, 3 and 4 kHz) bilaterally without acoustic hearing aids.[1]

The British Cochlear Implant Group annual data collection report for 2018–2019 found that 1003 adults received unilateral or bilateral cochlear implants,[3] continuing the recent trend of increasing cochlear implantation demand. The British Cochlear Implant Group has yet to release the most recent data, but under the TA566 guidelines, NICE has predicted an estimated 890 more eligible children and adults, and a 70 per cent increase in the number of cochlear implantations performed yearly.[3] A rise in the number of referrals from district general hospitals, and hence overall demand on implant centres, is expected. A recent study from East Kent Hospitals University NHS Foundation Trust has already identified increases in cochlear implantation eligibility locally.[4] Currently, adult referrals from district general hospitals are assessed and handled by 19 UK-based implant centres.

This study aimed to quantify the number of patients eligible for cochlear implantation under the TA566 guidelines within the last five years at Southend University Hospital, and to identify factors that influence patients' decisions surrounding cochlear implantation referral.

Materials and methods

Setting

Southend University Hospital is a 700-bedded tertiary referral centre serving a catchment population of approximately 338 800; it is one of three similarly sized hospitals within the

Mid and South Essex NHS Foundation Trust. At present, the hospital (and Trust) is served by three cochlear implantation centres: Guy's and St Thomas' NHS Foundation Trust, Addenbrooke's Cambridge University Hospital and University College London Hospital.

Patients presenting with profound SNHL are assessed by National Health Service (NHS) audiologists and have their audiograms recorded on the computer-based Auditbase software version 5.4.4 (Auditdata, Taastrup, Denmark). In accordance with local policy, patients who are found to meet current cochlear implantation criteria are counselled about cochlear implantations and offered a referral to one of the regional cochlear implantation centres. If patients need further time to decide, they are given printed information and asked to return if they wish to proceed.

Inclusion and exclusion criteria

All patients who met audiological criteria for cochlear implantation under the TA166 guidelines (hearing loss of 90 dB Hz or more, averaged at 2 kHz and 4 kHz bilaterally) or TA566 guidelines (hearing loss of 80 dB HL or more, at any two or more frequencies of 0.5, 1, 2, 3 and 4 kHz, bilaterally) were included in the quantitative analysis.

Regarding the qualitative analysis, which involved interview or questionnaire data, any patients aged less than 18 years, or with support needs and cognitive impairments that might preclude their involvement in interviews and/or questionnaires, were excluded.

Statistical analysis

Data were analysed using Microsoft™ Excel™ for Mac spreadsheet software, version 15.15.

Quantitative analysis

Retrospective analysis of audiological data for a five-year period, from 1 April 2014 to 1 April 2019, was performed, to identify the number of patients who would have met audiological criteria for the TA166 guidelines and the TA566 guidelines. Regarding the latter guidelines, 10 separate searches for thresholds were undertaken: (1) 80 dB HL or more at 0.5 kHz and 1 kHz; (2) 80 dB HL or more at 0.5 kHz and 2 kHz; (3) 80 dB HL or more at 0.5 kHz and 3 kHz; (4) 80 dB HL or more at 0.5 kHz and 4 kHz; (5) 80 dB HL or more at 1 kHz and 2 kHz; (6) 80 dB HL or more at 1 kHz and 3 kHz; (7) 80 dB HL or more at 1 kHz and 4 kHz; (8) 80 dB HL or more at 2 kHz and 3 kHz; (9) 80 dB HL or more at 2 kHz and 4 kHz; and (10) 80 dB HL or more at 3 kHz and 4 kHz.

The data were then cross-referenced to give a cumulative total number of patients who fulfilled criteria for each year in any of the hearing frequency categories. Patients were excluded if they had been previously included in another frequency range. A paired *t*-test was performed to compare the number of patients who were audiologically eligible for cochlear implantation based on TA166 and TA566 guidelines over the five-year study period.

Qualitative analysis

A retrospective search was conducted of the electronic files for patients seen between March 2019 and March 2020. A total of 232 patients were identified as eligible for cochlear implantation. The data for these patients were classified into four categories based on patient outcomes with respect to cochlear implantation: (1) referred to tertiary centre; (2) not referred, currently outside of other cochlear implantation criteria (e.g. fluctuating hearing loss); (3) patient declined referral; and (4) no further action taken (Table 1).

Table 1. Outcomes for Southend University Hospital adult population eligible for cochlear implantation

Outcome	Patients (*n* (%))
Referred to tertiary centre	11 (4.7)
Not referred, currently outside of other cochlear implantation criteria	20 (8.6)
Patient declined referral	64 (27.6)
No further action taken	137 (59.1)
Total	232 (100)

Patients noted to have 'declined' further referral (outcome three) were invited to a virtual semi-structured interview. In addition, patients from both outcome three ('declined') and outcome four ('no further action taken') groups were offered an online questionnaire platform or a telephone interview. This was based on a 10-point questionnaire developed with the consensus of all principal authors (Table 2). The questionnaire consisted of seven closed questions (questions 1, 2, 4, 6, 8, 9 and 10) and three open questions (questions 3, 5 and 7). Interview responses were transcribed during telephone interviews and recorded in Microsoft Excel. Questionnaire responses were also exported to Microsoft Excel. Both questionnaire and telephone interview responses were analysed uniformly as a single dataset. Answers to open questions from the interviews (questions 3, 5 and 7) were uploaded to Nvivo™ for Mac version 12.0 software for thematic inductive analysis. Accuracy of the questionnaire responses was checked by authors LT and BY.

Results

Quantitative analysis findings

The numbers of patients considered audiologically eligible for cochlear implantation based on TA166 and TA566 guidelines over the study period are compared in Table 3. There is a yearly increase in eligibility when using the TA566 guidelines. The relative percentage increase varies yearly from 223 per cent to 317 per cent, with an average relative percentage increase of 259 per cent ($p < 0.001$). The majority of patients eligible for cochlear implantation ($n = 274$; 76.3 per cent) met the criteria based on hearing thresholds of 80 dB HL or more at 3 kHz and 4 kHz (Figure 1).

Qualitative analysis findings

Twenty randomly chosen patients from the outcome three ('declined' further referral) group (average age of 55.7 years) were offered virtual semi-structured interviews; 133 patients from outcome three ('declined') and four ('no further action taken') groups (average age of 72.9 years) were offered an online questionnaire or telephone interview. Of the 18 patients who accepted this offer, 16 responded to the online survey platform and 2 underwent a virtual interview.

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Table 2. Questionnaire delivered to patients in qualitative section of service evaluation

Question no.	Description
1	Have you been offered a cochlear implant assessment referral by the Audiology Department at Southend University Hospital in the past 6 years (since 2014)?
2	If you were offered a cochlear implant assessment referral, did you accept or decline the offer of a referral?
3	If you previously accepted or declined a referral for a cochlear implant, could you please explain why this was?
4	If you were offered a referral for cochlear implant now, would you accept or decline?
5	Could you please explain your answer to question 4?
6	In the UK currently, cochlear implants are carried out at specialist centres. The two closest cochlear implant centres to Southend University Hospital are Guy's and St Thomas' Hospital, London, and Addenbrooke's Hospital, Cambridge. If you were referred to one of these centres for a cochlear implant, would you be able to attend your clinic and audiology appointments, surgery, and post-surgery check-ups?
7	If you answered 'no' to the previous question, could you please indicate if any of the following reasons apply to why you would not be able to attend? Cost/Time/Mobility/Care commitment/Other. Please feel free to add any additional reasons in 'Other'
8	Do you think you would be more inclined to consider a cochlear implant if the assessment, surgery and follow-up appointments took place in a hospital local to you, such as Southend University Hospital?
9	Are you satisfied with the current quality of your hearing, including when using a hearing aid (if applicable)?
10	Are you proficient in a manual mode of communication such as British Sign Language (BSL) or American Sign Language (ASL)?

Question no. = question number

Table 3. Numbers of patients audiologically eligible for cochlear implantation using NICE 2009 and 2019 criteria

Parameter	Year						
	2014	2015	2016	2017	2018	2019	Average value
Patients eligible for cochlear implantation (*n*)							
– Determined using NICE 2009 (TA166) criteria	67	78	70	76	76	98	77.5
– Determined using NICE 2019 (TA566) criteria	240	252	233	270	317	359	278.5
Relative % increase in patients meeting audiological criteria from 2014 to 2019 (%)	258	223	233	255	317	266	259

NICE = National Institute for Health and Care Excellence

Closed questions

The closed questions were 1, 2, 4, 6, 8, 9 and 10. Of the 18 respondents, 5 (27.8 per cent) reported having been offered referral for cochlear implantation assessment within the last six years (since 2014) (question 1). Of these, four declined and one accepted referral (question 2). Thirteen patients (72.2 per cent) responded that they had not been offered referral since 2014 (question 1). When asked later in the question set whether, if offered cochlear implantation referral today, they would accept or decline, nine patients (69.2 per cent) responded that they would accept and four (30.8 per cent) said they would decline (question 4).

When asked whether they would be able to attend either of the two closest cochlear implantation centres if referred, 17 patients responded; of these, only 9 (52.9 per cent) answered 'yes' and 8 (47.1 per cent) answered 'no' (question 6). Respondents who stated they would not be able to attend a cochlear implantation centre were then asked about barriers to access (cost, time, mobility) that applied to them, or to expand further in their response to 'other' (question 7). Of the seven respondents who answered, three (42.9 per cent) selected 'mobility', two (28.6 per cent) selected 'mobility' and 'cost', one (14.3 per cent) selected 'mobility', 'cost' and 'time', and one (14.3 per cent) selected 'age'. The majority of respondents ($n = 6$, 85.7 per cent) selected 'mobility' as a reason. One respondent expanded further, stating 'fear of becoming infected with Covid-19 [coronavirus disease 2019]' as a barrier. When asked if they would be more inclined to pursue cochlear implantation if assessment, surgery and follow-up appointments were carried out at their local hospital, 11 patients (61.1 per cent) responded 'yes' and 7 (38.9 per cent) responded 'no' (question 8).

Patients were asked to identify their degree of satisfaction with their current level of hearing, including when using acoustic hearing aids, using a five-point Likert scale. Six out of 18 patients (33.3 per cent) selected 'extremely dissatisfied'; 6 patients (33.3 per cent) selected 'somewhat dissatisfied'; 5 patients (27.8 per cent) selected 'somewhat satisfied'; 1 patient (5.6 per cent) selected 'neutral'; and 0 patients selected 'extremely satisfied' (question 9).

Lastly, patients were asked if they were proficient in any manual mode of communication, such as British or American Sign Language ('BSL' or 'ASL'), to which all 18 respondents answered 'no' (question 10).

Open questions

The open questions were 3, 5 and 7. There were four main themes relating to the experience of patients suitable for cochlear implantation: age, risk–benefit, mobility and desire for improved hearing.

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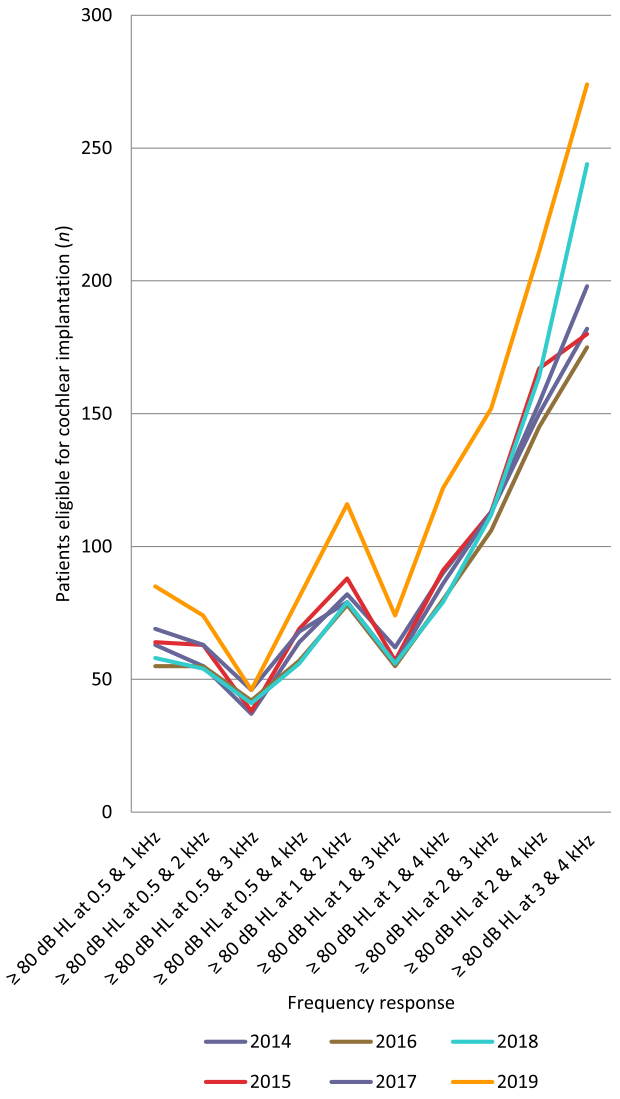

Fig. 1. Comparison of the numbers of patients eligible for cochlear implantation in each year, based on the National Institute for Health and Care Excellence 2019 (TA566) criteria and the frequency at which they met the criteria.

Age

Of the four respondents who had previously declined further referral, three (75 per cent) stated they would decline again (question 4). When asked to expand, all three respondents referred to age as being the primary reason for declining a referral. Age was often coupled with other factors, such as surgical risk and 'fear of catching other things in hospital'. For example, participant 17 stated: 'I felt that they [cochlear implants] should be received by younger people who could have a greater benefit from them. I'm older now and wouldn't want to risk surgery but I am not pleased with the quality of my hearing'. One patient stated they would accept referral for a cochlear implant if offered it now, and further explained they would want to know what benefit could be realistically expected (question 5).

Risk–benefit

A theme widely reported by participants declining cochlear implantation included the feeling that their hearing had not deteriorated enough to warrant surgery, and uncertainty about the risk of surgery versus the potential benefit. Of the nine patients who would accept cochlear implantation if offered it now (question 4), five (55.5 per cent) were keen to identify whether cochlear implantation would be of benefit. For example, participant 12 stated: 'I would like to know if I would benefit from it or not'.

Desire for improved hearing

Participants' desire for better communication, improved relationships and increased social interaction were strong factors that would lead to cochlear implantation acceptance if offered it now. Of the nine respondents who stated they would accept cochlear implantation if offered it now (question 4), four (44.4 per cent) of the responses were classified into the category 'desire for improved hearing', as patients expressed dismay at their current level of hearing and the social isolation they felt this had caused. For example, participant 5 stated: 'My deafness is long-standing, and I feel socially isolated. I live on my own'. In addition, participant 15 responded: 'I am currently having many problems both with my hearing and with infections and would consider anything that would improve my situation'.

Mobility

Mobility was a recognised barrier to patients attending cochlear implantation centres. Of the eight patients who stated they would not be able to attend a cochlear implantation centre (question 7), four (50 per cent) listed 'mobility' as being a barrier to attending.

Other

Of the four patients who declined cochlear implantation, one (25 per cent) mentioned a moral reason. Specifically, participant 18 stated: 'I did attend the specialist centre. I was assessed and offered a cochlear implant, but I asked about whether they had ever been tested on animals. I was told they were tested on cats. I returned home, did my own research and was horrified'.

Discussion

Synopsis of key findings

Our study has shown that by applying TA566 guidelines to our patient population, and measured against TA166 guidelines, between 2014 and 2019 we would have seen a 259 per cent (almost three-fold) increase in cochlear implantation eligibility. This figure represents patients only at Southend University Hospital, which is one of three similarly sized hospitals within one NHS Trust. The majority of these patients were found to have thresholds of 80 dB HL or more at 3 kHz and 4 kHz. The number of patients eligible for cochlear implantation was also seen to steadily increase from 2014 to 2019, suggesting that this trend will only continue in the future.

We also showed several barriers to cochlear implantation from the patients' perspective, most of whom are elderly. While some barriers are patient-centred (e.g. health-related anxieties, misperceptions about the implantation process), the ability to get to regional implant centres was a commonly cited barrier, with the majority of patients stating that they would be more inclined to pursue cochlear implantation if offered locally. Irrespective of the reason given for declining referral, the majority of patients felt dissatisfied with their level of hearing, and social isolation was a concern.

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Comparison with other studies

Our quantitative findings mirror those of Grounds *et al.* (2020), who showed a relative percentage increase in cochlear implantation demand from year to year of 144–172 per cent, with an average relative percentage increase in eligibility on audiological grounds of 163 per cent ($p = 0.0009$).[4]

With respect to our qualitative findings, the barriers to cochlear implantation identified in our study were similar to those found by Bierbaum *et al.* (2020). These authors identified several barriers in their populations across Australia and the UK, including limited knowledge of cochlear implantations, eligibility criteria, and referral processes.[5] Less referral complexity has been proposed as one solution.[6]

Decentralising some or all of the implantation process is one way that external barriers such as logistics can be overcome. Regarding implantation itself, the British Cochlear Implant Group outline the minimum requirements needed at implant centres with respect to the surgical skill set and implantation process.[7] Through adequate support and training, it is possible that these requirements can be realised, thus facilitating decentralisation.

Decentralisation could also have the added benefit of expanding implantation services to match increasing demand, which is now even more pertinent with waiting times considerably longer because of elective NHS work restrictions as a result of the Covid-19 pandemic. As of November 2020, there were 1.4 million elective orthopaedic patients awaiting surgery, three times the pre-coronavirus average. Even with the implementation of vaccines, the impact of Covid-19 on waiting times for NHS patients will be felt for years to come.[8,9] Currently in the UK, there are 19 cochlear implantation centres, with 41.5 consultant surgeons and 6 national cochlear implantation fellowships.[4]

Finally, it is worth mentioning the recognised importance of hearing loss rehabilitation in the prevention of dementia.[10] This is of particular importance in populations such as ours where the majority of patients fulfilling cochlear implantation criteria are elderly. Timely, local provision of cochlear implantation services for those in need may play an important role in reducing the co-morbidity and social burden associated with the onset of dementia within these communities.

Study limitations

Eligible patients were identified based on pure tone audiometry findings and not NICE-recommended Arthur Boothroyd testing, the latter of which is not routinely performed at our hospital.

- The number of UK cochlear implant eligible candidates has greatly increased following updated guidelines
- This has put pressure on cochlear implantation centres and the hospitals referring to them
- Current referral systems have external and patient-centred barriers to implantation, with logistical issues and a patient preference for local services
- The UK cochlear implantation service delivery may need rethinking to meet increasing populational demands and improve accessibility

This study only focuses on numerical eligibility rather than uptake of cochlear implantation. As stipulated in previous studies, co-morbidities, patient choice and access to audiology services can affect the proportion of adult patients who eventually undergo cochlear implantation.

The small number of respondents in the qualitative analysis was mainly because of Covid-19-related restrictions for face-to-face consultations. Many patients were also elderly and had reservations about visiting the hospital even when restrictions were partially lifted. Virtual and telephone interviews were also unpopular in light of technophobia and hearing difficulties. Anecdotally, however, the responses were representative of the views expressed by many patients attending our clinic.

Conclusion

With the introduction of the TA566 guidelines, cochlear implantation eligibility has greatly increased in the UK, putting pressure on cochlear implantation centres and the referring district general hospitals. The current referral systems have both external and patient-centred barriers to implantation, with logistical issues being prominent and patients' preference for local services. The way that cochlear implantation in the UK is delivered may need to be rethought in order to meet increasing populational demands and improve accessibility for those most vulnerable to these barriers.

Data availability statement. Data are available from the authors on request.

Competing interests. None declared

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